Indicator: Contaminated Groundwater Under Control on Contaminated Lands (221)

Contaminated lands include sites contaminated as a result of improper disposal of toxic and hazardous wastes in the past, as well as improper handling or accidents occurring at active hazardous waste management facilities. People and ecosystems can be harmed if they come into contact with these toxic and hazardous materials, either on-site or as a result of migration offsite through air, water, and groundwater. Trends in addressing the area covered by contaminated lands are all difficult to document on a nationwide basis, because efforts have focused on characterization of contamination and remedial responses at specific sites and their local surroundings, and because federal and state governments use a variety of laws and regulations to initiate, implement, and enforce cleanup. Restoration at the nation's most contaminated lands, however, is managed primarily by EPA's Superfund Program or its RCRA Corrective Action Program.

The Superfund Program investigates and collects data on potentially contaminated sites to determine whether they are contaminated and require cleanup. When a potentially hazardous waste site is reported to EPA, trained inspectors determine whether the site presents a hazard to human health and the environment. Sites that pose the greatest threat are placed on the National Priority List (NPL). Sites are considered for deletion from the NPL when all cleanup goals are met and there is no further need for federal action. Approximately 40 million people, 13% of the US population, live within 2.5 miles of an NPL site. A site that has been proposed to the NPL is termed "final" once it has been formally added to the NPL.

The RCRA Corrective Action Program addresses the clean-up of contamination at active hazardous waste management facilities arising from current or past solid and hazardous waste management activities. Approximately 6,000 hazardous waste management facilities fall within the domain of the RCRA Corrective Action Program. Approximately 3,800 of these facilities have corrective action already underway or will need to implement corrective action as part of the process to obtain a permit to treat, store, or dispose of hazardous waste. A cleanup baseline of 1,714 of these were designated high-priority sites targeted for immediate action by federal, state, and local agencies and are used as the baseline against which the cumulative number of corrective action sites with human exposure under control are measured.

One of the priorities for these sites is controlling any migration of contaminated groundwater away from the site. EPA and state officials determine contaminated groundwater migration is under control when on-going monitoring shows that the contaminant plume is not expanding or impacting surface waters. This may occur due to an action taken, such as installation of a "pump and treat" or subsurface barrier system, or because of natural attenuation of the waste. This determination is based on monitoring data (usually hundreds of analytical samples) collected from groundwater wells that surround the site. This indicator is based on the percentage of sites that have been designated "contaminated groundwater under control" at the 1,714 high-priority RCRA Corrective Actions sites and a baseline of 1,275-1,328 NPL sites. Sites that are not designated as under control are designated either "not under control" or as having "insufficient data" (EPA 2004).

What the Data Show

Control of migration of contaminated groundwater increased from 32% of the 1,714 high-priority RCRA Corrective Actions sites in 2000 to 70% of the sites in 2004, increasing 10% each year on average (Figure 221-1).

Control of migration of contaminated groundwater increased from 60% of 1,272 final and deleted NPL sites with contaminated ground water in 2002 (the first year this indicator was calculated for NPL sites) to 67% of 1,328 final and deleted with contaminated groundwater NPL sites in 2004 (Figure 221-2).

Indicator Limitations

- The NPL does not represent all of the contaminated or potentially contaminated sites listed in the CERCLIS database, the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database that contains information on hazardous waste sites, potential hazardous waste sites, and remedial activities across the nation.
- The indicator covers the 1,714 high-priority RCRA corrective action sites, and not the entire group of 6000 hazardous waste management sites that fall under the RCRA Corrective Acton Program.
- Concentrations of toxic and hazardous waste that must not be exceeded to designate a site as under control vary from state to state.
- The indicator is based on the certification by a responsible official that the criteria necessary to designate a site as under control have been met. To the extent that the certification lags the actual year in which migration of contaminated groundwater away from the site actually came under control , or was the result of having insufficient information in previous years, the actual trend in the percentage of sites in which the migration of contaminated groundwater was under control may be underestimated**.**
- Regarding NPL sites, 3 years (2002-2004) may not be enough time to assess a trend of groundwater migration under control.

Data Sources

National Priority List/Superfund Sites: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. CERCLIS. http://www.epa.gov/enviro/html/cerclis/

RCRA Corrective Action Sites: U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. RCRA Corrective Action. http://www.epa.gov/epaoswer/hazwaste/ca
http://www.epa.gov/epaoswer/hazwaste/data/index.htm#rcra-info

References

U.S. Environmental Protection Agency, RCRA Corrective Action, Environmental Indicators. Office of Solid Waste and Emergency Response (2004). http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm

Graphics

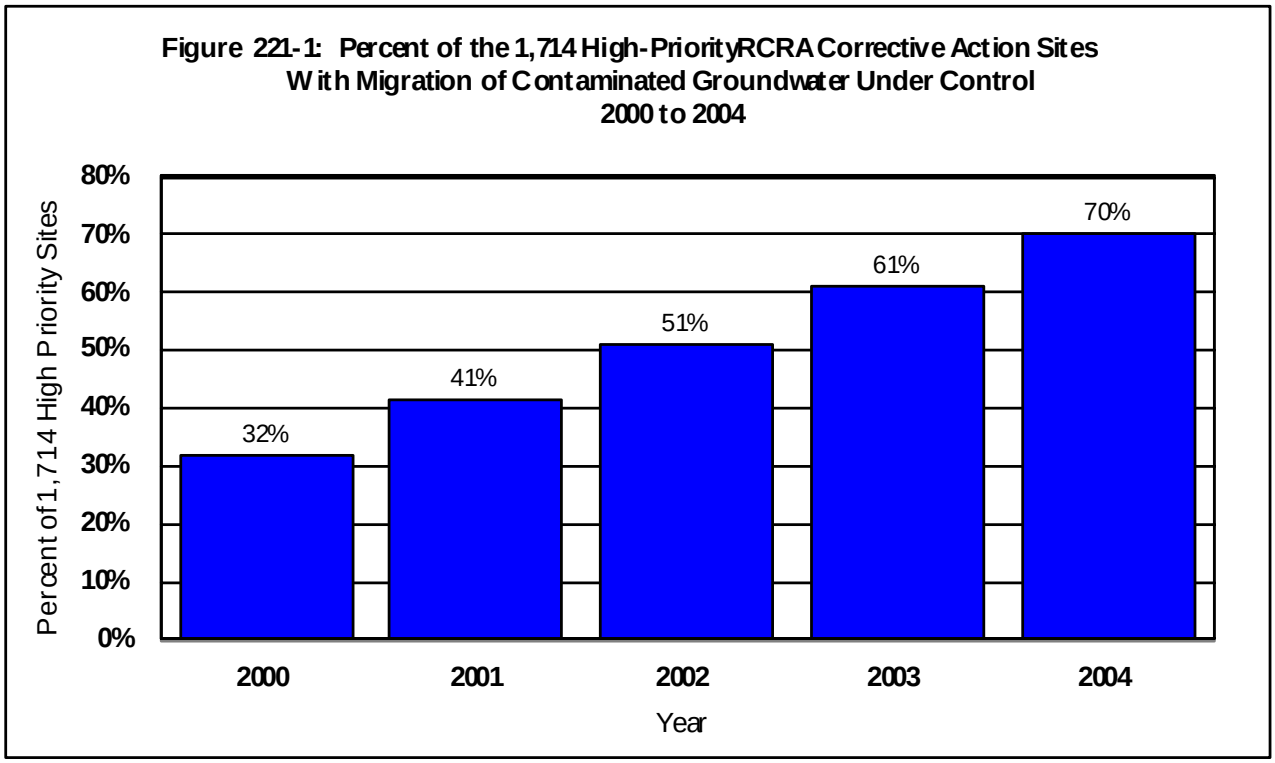
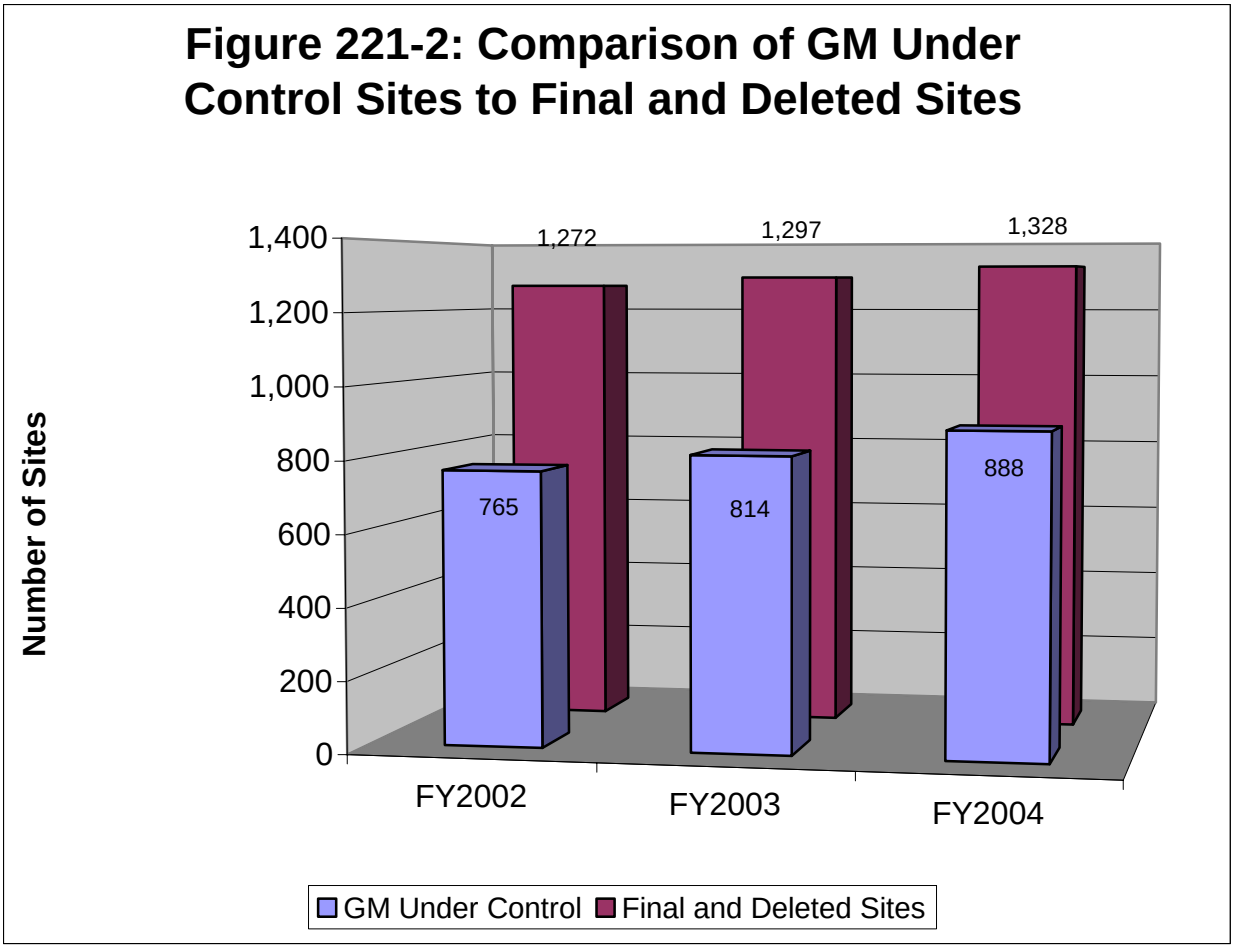


Figure 221-1: Percent of the 1,714 High-Priority RCRA Corrective Action Sites With Migration of Contaminated Groundwater Under Control 2000 to 2004
Percent of 1,714 High Priority Sites
80%
70%
60%
50%
40%
30%
20%
10%
0%
32%
41%
51%
61%
70%
2000
2001
2002
2003
2004
Year

Figure 221-2: Comparison of GM Under Control Sites to Final and Deleted Sites



R.O.E. Indicator QA/QC

Data Set Name: CONTAMINATED GROUNDWATER UNDER CONTROL ON CONTAMINATED LANDS
Indicator Number: 221 (116287)
Data Set Source: CERCLIS; RCRA Info
Data Collection Date: Ongoing: 2001 - Present
Data Collection Frequency: 1 year
Data Set Description: At Superfund and high priority RCRA Corrective Action sites with contaminated ground water, indicates whether contamination is below protective, risk-based levels or, if not, whether the migration of contaminated ground water is stabilized and there is no unacceptable discharge to surface water and monitoring will be conducted to confirm that affected ground water remains in the original area of contamination.
Primary ROE Question: What are the trends in contaminated land and their effects on human health and the environment?

Question/Response

T1Q1 Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?

Yes. The indicator relies on three types of information: 1) ground water monitoring data (contaminant concentrations; 2) hydraulic data and ground water modeling data; and, in cases where there is ground water-to-surface water discharge, 3) findings from examinations of potential ecological effects (e.g., via bio-assays/benthicsurveys or site-specific ecological Risk Assessments). Contaminant data are collected using standard sampling and analytical methods that result in data of known quality. Ground water hydraulic and modeling data are collected using standard methods relied upon for risk management decisions at Superfund sites. Ecological risk assessment practices are well defined and widely accepted as a valid basis for ecological risk characterization at Superfund sites. Determinations at high priority RCRA Corrective Action sites with groundwater discharges to surface waters also permit the use of bioassays, benthic surveys, and other well-established tools for assessing potential effects on ecological receptors.
http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm
http://www.epa.gov/superfund/accomp/ei/ei.htm

T1Q2 Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?

Yes. Regional and state (for RCRA Corrective Action) personnel respond to a survey based on data collected and conclusions derived (e.g., through capture zone analysis) from sampling designs, monitoring plans, and other field observations that were established as the basis for risk management decisions at Superfund and high priority RCRA Corrective Action sites and are based on sound scientific principles. http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm
http://www.epa.gov/superfund/accomp/ei/ei.htm

T1Q3 Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?

Yes. The conceptual model relies on straightforward questions that relate monitoring and/or modeling data to the question of whether contamination in ground water is migrating. Modeling data are used as a line of evidence for capture zone analysis and to evaluate ground water-to-

surface water discharge. http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm http://www.epa.gov/superfund/accomp/ei/ei.htm

T2Q1 To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?

The indicator measures the effect of EPA actions at Superfund and high priority RCRA Corrective Action sites on stressors to ground water resources. The indicator does not measure ambient ground water quality but, rather, pressures (contaminants) on ground water quality.

T2Q2 To what extent does the sampling design represent sensitive populations or ecosystems?

The indicator is a measure of pressure on ground water resources, rather than a direct indicator of human health exposure. It does not distinguish among populations.

T2Q3 Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?

The extent of the contaminated plume is defined based on risk-based contaminant levels. Plume migration is measured based on hydraulic and contaminant monitoring data.

T3Q1 What documentation clearly and completely describes the underlying sampling and analytical procedures used?

The FY-04/05 Superfund/Oil Implementation Manual (SPIM) outlines indicator definitions and reporting requirements. http://www.epa.gov/superfund/action/process/spim04.htm (See Appendix B, Part IV). The Superfund Environmental Indicators Guidance Manual includes a discussion of indicator background, reporting requirements, detailed instructions for making the Migration of Contaminated Ground Water Under Control determination, frequently asked questions, and CERCLIS data entry instructions. The RCRA Corrective Action website provides detailed instructions for making the Migration of Contaminated Groundwater Under Control determination, frequently asked questions, and training slides. See http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm Further guidance is provided in the Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA/600/R-00/007), see http://www.epa.gov/QUALITY/qs-docs/g4hw-final.pdf; Guidance for the Data Quality Objective Process (EPA/600/R-96/055), see http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf; and SW-846: Test Methods for Evaluating Solid Waste Physical/Chemical Methods, see http://www.epa.gov/epaoswer/hazwaste/test/main.htm#Table

T3Q2 Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?

Migration of Contaminated Ground Water Under Control determinations at NPL sites (this indicator is limited to NPL sites) can be viewed via the CERCLIS Public Access database. http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm Further information on the Migration of Contaminated Ground Water Under Control indicator including definition and quarterly data can be viewed via the Superfund Environmental Indicators Website. http://www.epa.gov/superfund/accomp/ei/gw.htm Information on the Migration of Contaminated Groundwater Under Control indicator determinations for priority RCRA Corrective Action sites can be found at http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm, with links to each EPA Region's Corrective Action website where details about each facility accessed can be observed.

T3Q3 Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

The Migration of Contaminated Ground Water Under Control survey is available in Portable Document Format (PDF) on the Superfund Environmental Indicators Website. http://www.epa.gov/superfund/accomp/ei/gwsurvey.pdf Information on the Migration of Contaminated Groundwater Under Control indicator determinations for priority RCRA Corrective Action sites can be found at http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm, with links to each EPA Region s Corrective Action website where details about each facility accessed can be observed.

T3Q4 To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

Migration of Contaminated Ground Water Under Control data quality objectives are thoroughly outlined in the Human Exposure/Migration of Contaminated Ground Water Under Control CERCLIS Data Quality Objectives (DQO) document. The DQO includes a discussion of data completeness, accuracy, timeliness, and consistency. The DQO is available to EPA Headquarters and the Regions via EPA's CERCLIS3 Document Database. The RCRA Corrective Action website provides detailed instructions for making the Migration of Contaminated Groundwater Under Control determination, frequently asked questions, and training slides. See http://www.epa.gov/epaoswer/hazwaste/ca/eis.htm Further guidance is provided in the Data Quality Objectives Process for Hazardous Waste Site Investigations (EPA/600/R-00/007), see http://www.epa.gov/QUALITY/qs-docs/g4hw-final.pdf; Guidance for the Data Quality Objective Process (EPA/600/R-96/055), see http://www.epa.gov/QUALITY/qs-docs/g4-final.pdf; and SW-846: Test Methods for Evaluating Solid Waste Physical/Chemical Methods, see http://www.epa.gov/epaoswer/hazwaste/test/main.htm#Table

T4Q1 Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

The unit of measure for the indicator is the site. This is a population measure not requiring inferential statistics. Due to lack of adequate data, the indicator does not measure the extent to which migration of contaminated ground water associated with non-NPL or lower-priority RCRA Corrective Action waste sites has have been mitigated, and does not attempt to generalize beyond ground water resources impacted by NPL and high priority RCRA Corrective Action sites. Currently, EPA believes that there are over 6,500 facilities subject to RCRA corrective action statutory authorities. Of these, approximately 3,800 facilities have corrective action already underway or will need to implement corrective action as part of the process to obtain a permit to treat, store, or dispose of hazardous waste. EPA refers to these 3,800 facilities as the "corrective action workload." To help prioritize resources further, EPA established specific short-term goals for 1,714 high priority facilities referred to as the RCRA Cleanup Baseline. The RCRA Corrective Action program ranked sites low, medium, or high priority, based on a site's environmental releases and potential for impacting people and the environment. If a facility ranked high before 1997, it was automatically included on the baseline. The states and EPA also added some sites to the RCRA Cleanup Baseline, which posed a potentially significant environmental risk or were of particular concern to communities, despite being ranked medium or low. The facilities on the RCRA Cleanup Baseline comprise the basis of the Corrective Action Program's 2005 goals under the Government Performance and Results Act (GPRA).

T4Q2 Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

Uncertainties in the ground water data used to support this indicator are evaluated on a site-specific basis but are not rolled-up for a measure of cross-indicator uncertainty. No formal study has been conducted regarding the reproducibility of survey responses.

T4Q3 Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

The uncertainty and variability could impact the conclusions that can be inferred from the data. However, unless there are systematic biases introduced to the process (e.g., systematic differences in interpretation of questions), the impacts of these factors on the aggregated data and overall conclusions should be minimal. The Superfund and RCRA Corrective Action programs has have implemented guidance and training to minimize the effects of variability and systematic bias.

T4Q4 Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

In some instances, there may be underlying factors (e.g., changes in MCLs (EPA periodically re-evaluates MCLs) used to identify contaminated ground water) that could cause a data shift, the cause of which would not be evident to the user. The indicator instrument documents reasons for changes in the indicator determination that could be monitored to identify and communicate to the user the effect of exogenous factors on indicator trends. Superfund NPL and RCRA Corrective Action sites are a subset of contaminated lands in the U.S.